

# Kaman Nuclear

GARDEN OF THE GODS ROAD, COLORADO SPRINGS, COLORADO, 80907  
A DIVISION OF KAMAN AIRCRAFT CORPORATION

February 1966

Dear Transducer User:

Enclosed are data sheets on the most recent addition to the Kaman Nuclear standard product transducer line. The K-1808 High Frequency Response, Variable Impedance, Acoustical Microphone has undergone extensive testing in shock, vibration and transient temperatures up to 3000°F. One of the unique uses of this unit is that it can be installed directly in rocket engine exhaust plumes. Other applications include measurements of noise from rocket launches, boundary layer turbulence and high sound-pressure-level noise measurements.

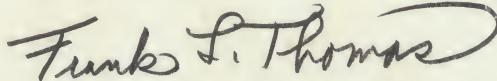
The K-5103 Oscillator-Demodulator is especially designed for aerospace applications where space is at a premium. This unit also has successfully passed rigid shock, vibration and temperature testing and can be mated to the acoustical microphone. A variety of other model oscillator-demodulators, single or multichannel, operating from d-c or a-c power inputs are optional.

Delivery of Kaman Microphone Systems can be made within 30 to 60 days after receipt of an order. Price for the system (transducer and its oscillator-demodulator) is approximately \$1,665.00, depending on the exact specifications agreed upon.

Kaman Nuclear also markets other transducers, such as displacement, linear position, pressure and the IR-100 Award Winning Accelerometer.

After your review of the enclosed information, I would be pleased to discuss your possible applications or provide any additional desired information. Please do not hesitate to contact this office if I can be of any assistance.

Sincerely yours,



Frank L. Thomas  
Manager, Transducer Sales

FLT/jg  
Encls.-K-1808 & K-5103 Data Sheets

## MODEL K-5103

### SINGLE-CHANNEL OSCILLATOR-DEMODULATOR



KAMAN NUCLEAR MODEL K — 5103  
SINGLE — CHANNEL OSCILLATOR DEMODULATOR

### FEATURES

1. Miniaturized design for aerospace-type applications
2. Adjustable null and output controls
3. D-c output may be specified to match most telemetry and recording systems
4. Operates from an unregulated 26-32 volt d-c input supply
5. Temperature compensated range may be selected from  $-65^{\circ}\text{F}$  to  $+225^{\circ}\text{F}$
6. Frequency response capability to 0 - 200 kc
7. Completely transistorized circuitry
8. Plated aluminum housing for minimum weight and maximum electrical conductivity
9. Designed for use in high level shock, acceleration and vibration environments
10. Radiation-hardened versions available for use in intense nuclear environments

The Model K-5103 is a miniaturized, single-channel oscillator-demodulator circuit designed for driving a Kaman variable impedance transducer and converting the transducer impedance changes to a proportional d-c output signal. The unit is similar to the Kaman Model K-5000 except that null and output potentiometers are used rather than fixed adjustments. Designed especially for aerospace applications, where small size and weight are important considerations, the K-5103 has excellent shock, acceleration and vibration specifications. Radiation-hardened versions of the K-5103 are also available for use in high level nuclear environment applications.

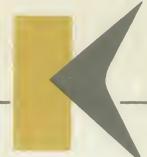
The K-5103 circuitry consists of a highly regulated 1 mc oscillator, amplifier stages and a stable, full-wave, phase-sensitive demodulator and output filter. The filter will reduce the ripple on the d-c output to less than 0.1% (referred to full scale d-c output). The filter is also designed to match the frequency response or rise time requirements of the particular transducer and recording system to be employed and may be specified from a range of 0 - 1 kc to 0 - 200 kc.

The K-5103 operates from an unregulated 26-32 volt d-c input supply with a current requirement of less than 50 ma. Internal regulation is 0.1% or better. The d-c output may be specified for any desired range up to 0 - 5 volts or  $\pm 2\frac{1}{2}$  volts with a circuit output impedance of 2500 ohms. Most standard telemetry or high speed recording systems can be operated with the output levels available from the K-5103.

Potentiometer adjustments are provided for setting zero and full range d-c output levels to exact values. An optional solid state calibration switch is also available as part of the K-5103 circuitry. Activated by an external d-c supply, the switch will place a fixed (usually 75% of full scale d-c transducer output) unbalance across one of the transducer bridge arms thereby providing a means of checking the entire system.

The normal temperature-compensated range of the K-5103 is  $+25$  to  $+175^{\circ}\text{F}$ . Standard temperature shift specifications are 0.01%/ $\text{F}$  referred to full range d-c output. Other compensated ranges, from  $-65^{\circ}\text{F}$  to  $+225^{\circ}\text{F}$ , depending on overall system requirements, may be specified at time of ordering.

The K-5103 circuitry is completely transistorized and uses only silicon transistors and diodes as active circuit elements. The unit weighs only 7 ounces and measures 1 x 1.75 x 2.25 inches, excluding connectors. The housing is aluminum with a gold-plated finish to provide good electrical contact to mating surfaces. The housing is mounted by means of four through holes in the case designed for #6 machine screws.



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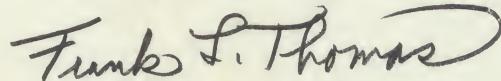
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## MODEL K-1808

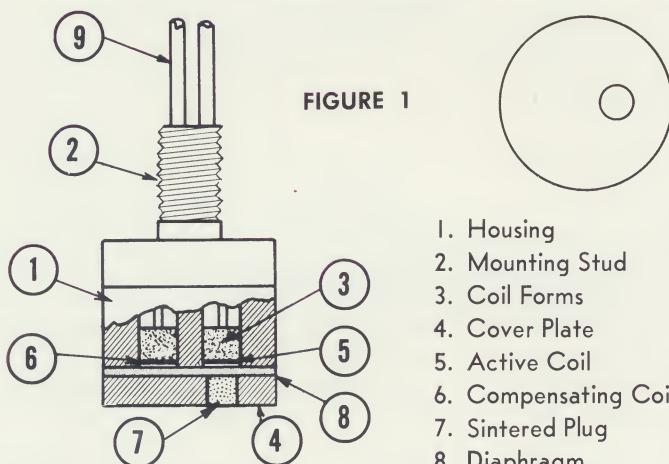
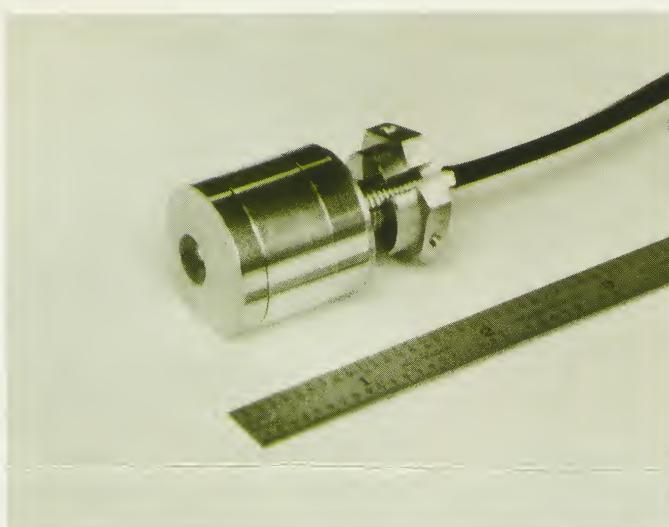


FIGURE 1

1. Housing
2. Mounting Stud
3. Coil Forms
4. Cover Plate
5. Active Coil
6. Compensating Coil
7. Sintered Plug
8. Diaphragm
9. Pigtails

## FEATURES

The Model K-1808 variable impedance microphone provides a combination of properties of special value in acoustical measurements.

1. Symmetrical design provides immunity to high thermal transient radiation.
2. Excellent temperature stability.
3. Constructed for operation in intense transient heat fluxes, gamma, neutron and electromagnetic fields.
4. Very low sensitivity to acceleration, vibration and shock.
5. Frequency response: flat  $\pm 2$  db or less, 0 to 10 kc.
6. Low transducer impedance.
7. Fabricated entirely from corrosion resistant metals and ceramics.
8. Transducer designed to be remotely located from oscillator-demodulator circuitry by long inter-connecting cable lengths.

## High Frequency Response Variable Impedance Acoustical Microphone

For use in Intense Thermal, Nuclear and Electromagnetic Radiation Under High Shock and Vibration

Kaman variable impedance microphones (U.S. and Foreign Patents applied for) have been especially designed for high intensity acoustic measurements. The Model K-1808 is the culmination of extensive research directed toward the design of a microphone that will operate in the severe space age environments of: (1) very high transient heat fluxes, (2) intense nuclear radiation, (3) extreme electromagnetic pulses, and (4) high-g, shock and vibration levels. Applications include jet and rocket engine noise level instrumentation, nuclear blast, shock wave and sound barrier shock acoustical measurements; and many other related uses where high frequency response, high db sound pressure level measurements are required in severe environments.

The K-1808 is available in ranges to measure sound pressure levels from 110-190 lb. The low transducer impedance (600 ohms or less) makes the K-1808 very insensitive to electrical noise pickup, and allows the use of long interconnecting cables. The microphone will accurately measure frequencies from d-c through 10 kc.

As the diagram shows, the Model K-1808 is an extremely simple and rugged instrument; a flat, stiff metal diaphragm is the only moving part. The diaphragm is clamped between the gage housing and the cover plate a short distance from the air core coils. Acoustical pressure is directed to the diaphragm area over the active coil. The second, or compensating, coil serves to maintain symmetrical balance of the transducer system to extraneous influence of temperature, shock, vibration and nuclear radiation. Acoustic pressure alone will cause an unbalanced variation in impedance. The flat coils, encapsulated in ceramic, are cemented in a beryllium copper housing.

The removable metal port covering the active diaphragm prevents a direct path of thermal radiation and debris from reaching the diaphragm. Other inlet port designs are also available and are interchangeable to meet specific requirements.

A microphone system consists of the transducer plus an oscillator-demodulator to supply the 1-mc driving voltage to the transducer and to convert the transducer impedance changes to an output signal. A variety of Kaman oscillator-demodulators, which operate from standard d-c or a-c supplies, are available.

Accuracy, linearity and stability are inherent with the Kaman variable impedance design. The flat dual diaphragm construction provides a unit with very low response to acceleration, vibration, and shock. Sensitivity shift with temperature will be less than  $\pm 0.003$  db $^{\circ}$ /F.

# MODEL K-1808

## HIGH FREQUENCY RESPONSE VARIABLE IMPEDANCE ACOUSTICAL MICROPHONE

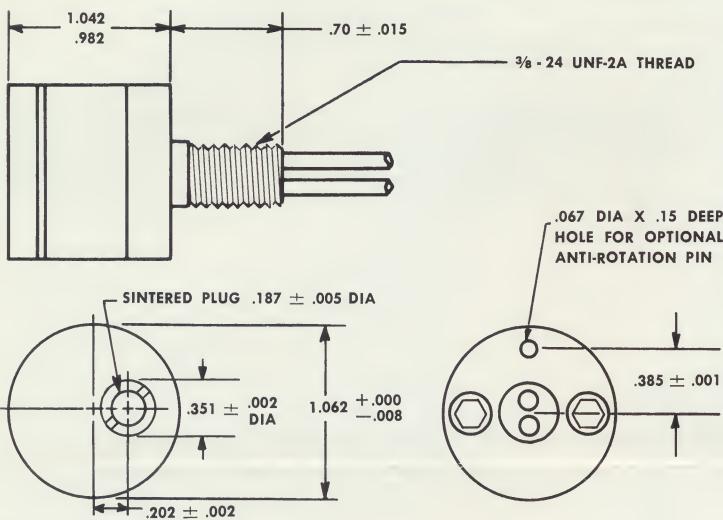


FIGURE 2  
DIMENSIONED DRAWING FOR MODEL K-1808

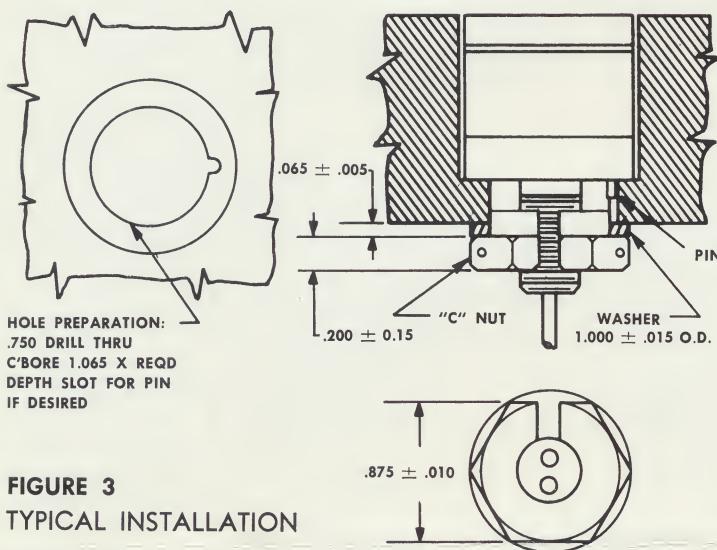


FIGURE 3  
TYPICAL INSTALLATION

**PRICE** Firm quotations on request.

**TERMS** Net 30 days from date of invoice.

When ordering or inquiring about Kaman Acoustic Microphones, the following information should be supplied:

1. Model Number (eg, K-1808)
2. Acoustic Range
3. Mounting Provisions
4. Frequency response required
5. Calibrated temperature range required
6. Maximum overpressure
7. Cable length required between gage and oscillator-demodulator
8. Oscillator-demodulator model number to be used with gage
9. Deviations from catalog specifications.

### SPECIFICATIONS

Acoustic Range	110 to 190 db sound pressure level (SPL.)
Service	Acoustic noise level measurement.
Input	I-mc at 3 volts (nominal) as supplied by Kaman Oscillator-Demodulator unit.
Output Signal	Normally 250 mv RMS at 180 db SPL. Using standard Kaman Oscillator-Demodulators.
Transducer Impedance	600 ohms or less each arm at I-mc. 20 ohms or less each arm d-c.
Frequency Response	0-10 kc flat to within ±2 db or less.
Maximum Pressure Without Affecting Initial Calibration	50 psig.
Calibrated Temperature Range	Ranges may be selected from -100°F to +400°F. +30°F to +130°F is standard unless otherwise requested.
Temperature Coefficient	Less than ±0.003 db/°F.
Temperature Transient Sensitivity	20 BTU/ft <sup>2</sup> /sec heat flux exposure for a period of 1 minute will be less than ±.1 db change.
Shock and Vibration Sensitivity	10-g equivalent to less than 110 db SPL.
Construction Materials	Fabricated of ceramics, non-magnetic stainless steel, beryllium-copper and other non-corrosive materials.
Electrical Connections	Normally supplied with 8 foot pigtail consisting of two Microdot No. 75-3802 Mini-Noise Teflon dielectric cables inside an overall jacket with Bendix No. PTO6P-8-4S connector installed on free ends.
Weight	4.1 ounces.
Size Any Mounting	See drawing for standard version. Changes in physical configuration are possible to meet specialized mounting requirements. Transducer is normally supplied with mounting washer and "C" nut as shown.

NOTE: The specifications listed above may be varied to meet a wide variety of customers' specific requirements. Firm specifications will be made at time of quotation.

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